From: Rochlin, Kevin
Sent: Wednesday, January 22, 2014 4:04 PM
To: Douglas.Tanner@deq.idaho.gov; Greutert, Ed [USA]; Kelly Wright; Scott Miller - Idaho DEQ (Scott.Miller@deq.idaho.gov); Stifelman, Marc; susanh@ida.net; Zavala, Bernie
Cc: Rochlin, Kevin
Subject: EPA Gamma Report Comments January 22.docx
Attachments: EPA Gamma Report Comments January 22.docx

Categories: 11-19 to 1-10 2014

Attached are EPA's draft comments on the Gamma Report.

The comments can be summarized as follows:

1) The gamma study was not able to demonstrate compliance with the required cleanup criterion due to gamma shine interference.
2) FMC will need to select, calibrate and demonstrate adequate instrumentation for conducting post construction monitoring.
3) FMC will have to meet the IRODA cleanup criteria post construction. EPA is not requiring an additional test pad test.

We will discuss these tomorrow.

Kevin

From:

Kevin Rochlin | **Superfund Remedial Project Manager**
U.S. Environmental Protection Agency | **Region 10**
Office of Environmental Cleanup
1200 6th Avenue, Suite 900, ELC-111 | **Seattle, WA 98101**
(206) 553-2106
(206) 553-0124 (fax)
rochlin.kevin@epa.gov

DRAFT for Discussion

TECHNICAL REVIEW COMMENTS ON THE FMC OU REMEDIAL DESIGN GAMMA CAP PERFORMANCE EVALUATION REPORT DATED NOVEMBER 2013

General Comments

1. The Gamma Cap Performance Evaluation Report identified important measurement interference issues related to gamma shine radiation. Impromptu evaluations indicated that the shine may potentially come from both onsite and offsite sources. These issues highlight the importance of the characterization of background levels.

2. Because of gamma shine, the performance evaluation was unable to demonstrate that the cap thicknesses calculated and tested were sufficient to reduce radiation levels to meet cleanup criteria.

3. Gamma shine also prevented demonstration that the instruments and methods used were sufficiently sensitive to evaluate residual radiation levels in the presence of background and gamma shine.

4. MARSSIM methods and Data Quality Objective (DQO)-based planning are necessary to develop a successful approach to gamma capping for remedial action. These should be used to determine the appropriate instruments for measurement, characterize background, and design surveys, and should be part of remedial design. The correct instrumentation will have to be proposed and successfully demonstrated prior to remedy implementation.

5. EPA is not going to require that FMC perform another capping performance test. However, the remedial action is required to meet the performance standards in the IRODA, and FMC will have to successfully meet this requirement.

Gamma Cap Performance Evaluation Report

1. Page 1-3, 2nd paragraph

As a result of the gamma shine encountered, the 17.4 uR/hr performance standard is not appropriate for the elevated background circumstances encountered in these tests. Performance criteria for the gamma cap should be developed based on the circumstances likely to be encountered at the site, and based on the specific instruments, calibrations, and configurations to be used.

The 17.4 uR/hr performance standard used in this report represents the gamma radiation exposure level necessary to meet an excess cancer risk level under the following important assumptions: (1) background gamma radiation levels are 14.6 uR/hr, and (2) an outdoor commercial/industrial worker scenario. The site-related component of the performance standard (2.8 uR/hr) is equivalent to an outdoor commercial/industrial worker excess lifetime cancer risk of 1E-04, and is equivalent to a soil concentration of Ra-226 of 3.8 pCi/g.

2. Section 1.3

The performance standard for the gamma cap tests was not demonstrated in this report.

Because of contributions to the ambient radiation fields from shine related to other sources, the essential assumption regarding background levels did not hold during the project, and therefore the performance standard could not be demonstrated. It could not be demonstrated that the test cap configurations were sufficient to reduce radiation to acceptable risk-based levels. Further, it could not be demonstrated that the PIC instrument used had sufficient sensitivity to detect the 2.8 uR/hr (over background) required to meet the performance standard. The fact that the required cap thickness has not been verified by tests places additional importance on post-installation verification measurements. Verification measurements should be carefully planned using MARSSIM and DQO methods.

The report offers evidence of significant variability of background on the site, as well as potential site and nonsite related influences on background. This presents significant challenges to methods for verification measurements. The most significant are selection of measurement instruments and development of survey protocols.

Since it is impractical to shield the entire site from shine, the most likely approaches to the problem of shine are: (1) develop location-specific background measurements for each measurement point or (2) perform measurement using instruments shielded to eliminate the influence of shine on the measurement. In the second case, it is important to note that since shielding changes the amount of background that an instrument "sees". Background levels will therefore need to be determined specifically for the shielding configuration and instrument used. For example if a PIC were shielded to cut out sources other than from the downward field of view, the "background" it would see would no longer be 14.6 uR/hr. It would be less. This effect is apparent from the data comparing collimated and unshielded configurations for sodium iodide measurements in the WUA (Table 3.3).

3. Page 3-5,Summary of Configuration 1

The performance standard was not demonstrated.

This section notes that in some cases radiation levels less than 17.4 uR/hr were achieved under conditions in which heavy equipment was used to shield the measurement from extraneous shine. It is not known, however, what the background would have been for this kind of configuration. The heavy equipment probably also would have reduced the normal background contribution to

the measurement. Since the 17.4 uR/hr performance standard is based on an assumed background level without heavy equipment shielding, measurements less than this level in the presence of shielding do not necessarily demonstrate that the performance standard was met.

4. Page 3-6, Summary of Configuration 4

It is not clear whether the apparent net average exposure rate decrease from Configuration 3 to Configuration 4 (0.2 uR/hr from 4.8 to 4.6 uR/hr) is statistically significant. \

5. Page 3-6, Summary of the Differences in Thickness and Exposure Rates Between Configurations 1 and 5

Final gamma cap thickness should consider not only the thickness necessary to meet minimum acceptable risk criteria, but also should consider operation and maintenance issues associated with the cap.

6. Section 3.2.

Correlations between the PIC and sodium iodide measurements were not supported. Any correlations between instruments should be made under similar conditions with the instruments measuring the same radiation fields.

The point that gamma cap and WUA data do not support regression correlation between sodium iodide CPM and PIC uR/hr is correct. Not only are there issues with the data coming from differing populations, but any attempt to correlate unshielded PIC measurements with collimated sodium iodide measurements would be questionable because the two instruments would not be measuring the same radiation field at any given location. The collimated sodium iodide would have a limited field of view, where the PIC would have a full view in all directions.

7. Section 4.2

The effectiveness of the cap thicknesses tested was not demonstrated.

The fact that there is no detectable difference in radiation measurement with the addition of soil to the test cap does not mean that the 14.1 inch cover was necessarily effective. As noted previously, the presence of gamma shine interfered with the demonstration that the performance standard had been met. The fact that there is no detectable difference between the cap thicknesses just means that the performance standard cannot be demonstrated at either thickness.

8. Section 4.2, page 4-2

The adequacy of the instruments used for meeting cleanup standards in these circumstances was not demonstrated.

It is clear that the unshielded PIC is not an appropriate instrument for demonstrating that gamma cap performance criteria consistent with risk-based cleanup criteria have been met in this situation where gamma shine confounds the measurements. Unshielded sodium iodide

measurements would probably encounter the same difficulty. It is worth noting, however, that sodium iodide detectors are capable of measuring Radium-226 levels consistent with the risk-based Ra-226 cleanup levels for this site (MARSSIM Rev. 1, Table 6.7). It is possible, therefore, that collimated sodium iodide measurements, with lower background, could be an alternative to the PIC instruments. Instrument and site-specific background levels for these configurations would need to be developed. No correlation with PIC instruments would be needed, but provisions would have to be made to calibrate the sodium iodide instruments to Ra-226 soil concentrations. Other surveys along these lines have used calibration pads in Grand Junction, CO.

9. Section 4.3 Recommendations

1. Post-remedial action monitoring plans following MARSSIM and DQO guidance should be included in the preliminary draft PSVP to be submitted as part of the Preliminary (30%) Remedial Design for the soil remedy. The surveys anticipated at FMC meet the definition of "Final Status Surveys" under MARSSIM, and should be planned, designed and carried out following that guidance. This process should be applied to the selection of survey instruments and the determination of required sensitivities and uncertainties. MARSSIM provides guidance and examples for the use of the DQO process and for the application of MARSSIM methods to final status surveys.

2. Consideration should be given to the development of an RD/RA Treatability Study, to be performed as the initial phase of the soil remedy on a small part of the site, to demonstrate the adequacy of surveys and sampling plans, instrumentation, and procedures prior to application to the entire site.

3. With regard to the performance standard of 17.4 uR/hr, this criterion will need to be evaluated in the context of MARSSIM guidance. In particular, MARSSIM deals with background using a statistically-based hypothesis testing approach. MARRSIM Appendix D provides a good example of a "2-sample" (i.e. where one sample is background reference) case. In MARSSIM the difference between reference (background) and residual concentrations is based on the difference between background and residual distribution means. This differs from the Gamma Cap Study approach of adding a risk-based increment to the 95% confidence level of background. Following MARSSIM, statistical tests would be performed to determine whether the background and survey area means differ by more than the risk-based cleanup level. Examples, including a stepwise approach to statistical evaluation of gamma data can be found in the Homestake Mining Company Removal Action Report from EPA Region 6.

4. The distribution of background data is an important issue, since wide variations in background would make evaluation of a small risk-based increment difficult. Since different

instruments (PIC, sodium iodide, high purity germanium) will have different distributions in their background data measurements, the statistical needs of MARRSIM evaluations are important considerations in the selection of survey instrumentation. Correspondingly, the type of instrument selected for the final status survey, and its calibration and configuration, determine the nature of the background data needed to support decision making. Background data should be obtained that will support these needs.

References and Examples:

Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM), EPA 402-R-97-016 Rev 1, August 2000.

Guidance for the Data Quality Objectives Process, EPA QA/G-4, EPA/600/R-96/055, August 2000

Removal Action Report for Homestake Mining Company, US EPA Region 6, May 2012